

MuID Twopack Efficiencies: Measurements with Cosmic Rays & High Voltage information.

Purposes

- To get a twopack by twopack understanding of detector health.
- To examine how well the High Voltage state correlates with detector efficiency.
- Obtain a reasonable set of twopack efficiencies for use in response chain... (Hiroki has already started)
- Develop possible tools/procedure for physics run efficiency calculations

Procedure

- Take cosmic data with known voltages and gap of interest out of trigger.
- Reconstruct roads with offline roadfinder which doesn't use information from gap of interest.
- Analyze DST events with only one road to find number of hits expected and found for each twopack.
- Use macro to calculate error bars and make plots.

Algorithm (one event)

1. Find number of raw hits that are within 20cm of reconstructed road in appropriate direction .
2. Get a list of twopacks hit by reconstructed road (expected hits).
3. If in 1. any hits were found for orient **a** then do following for orient **b** .
(this check is currently only done for Gap0 and Gap4)
4. For each expected hit mark the closest raw hit twopack(s) within 2 twopacks (closest 5 twopacks) as “matched”.
5. If no match is found for an expected hit., that twopack’s number of expected hits is incremented.
6. For each raw hit twopack marked as “matched”, increase the twopacks number of found and expected hits.

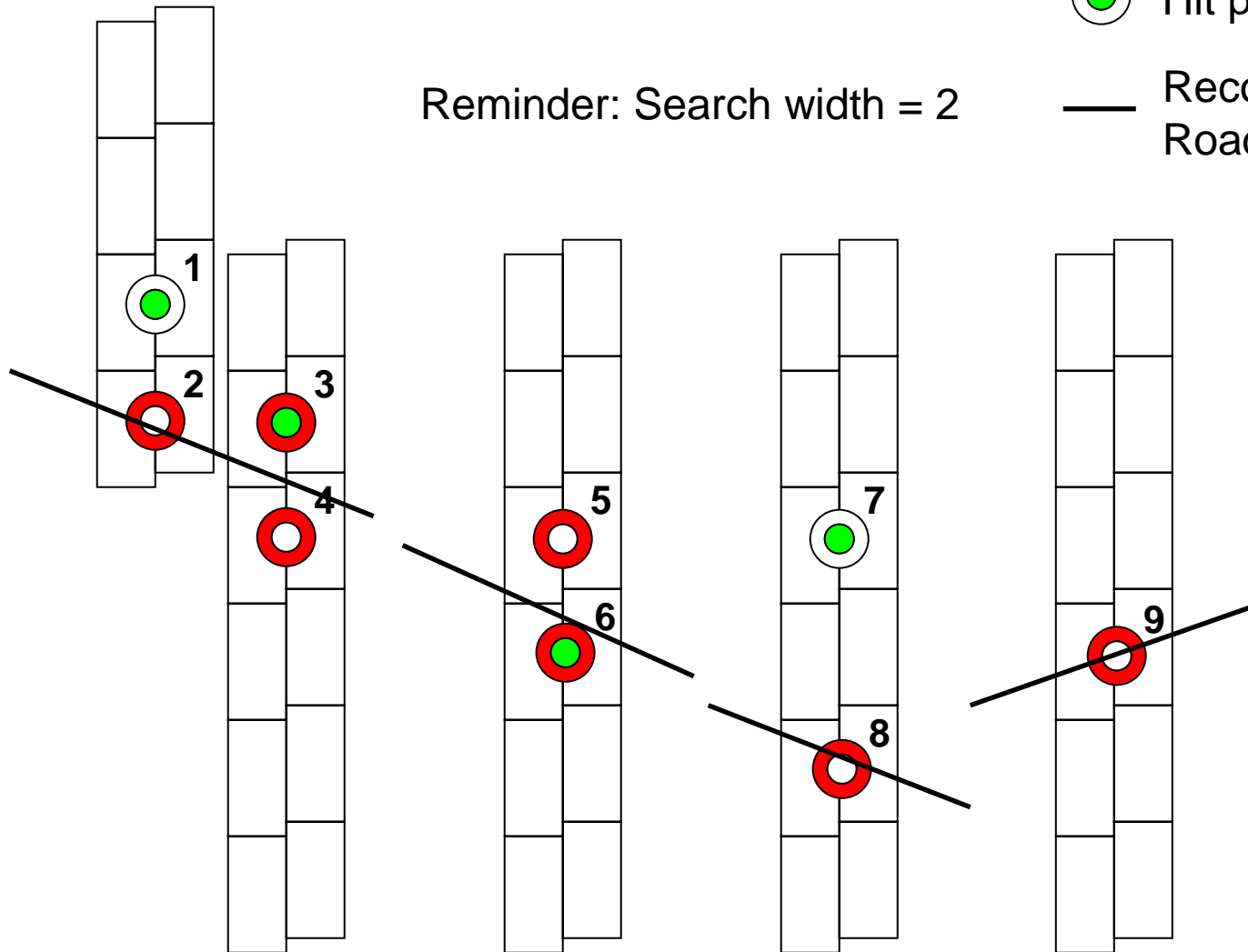
Algorithm response examples

 Road projection predicts a hit.

 Hit present in data

 Reconstructed Roads

Reminder: Search width = 2



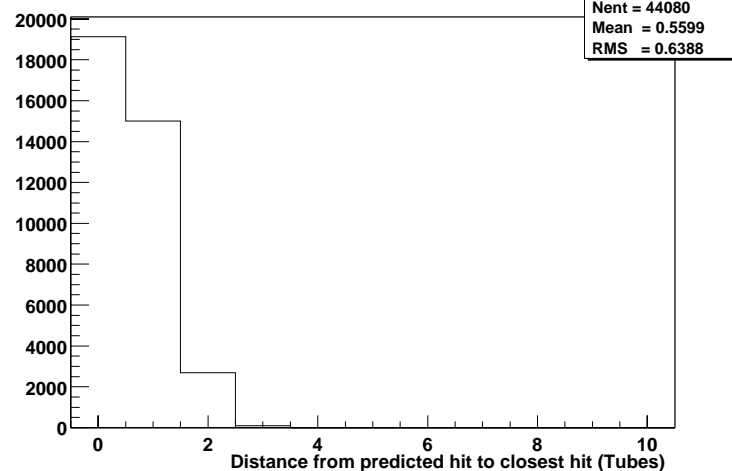
Efficiency = Num/Den

	ΔNum	ΔDen
1	1	1
2	0	0
3	1	1
4	0	0
5	0	0
6	1	1
7	1	1
8	0	0
9	0	1

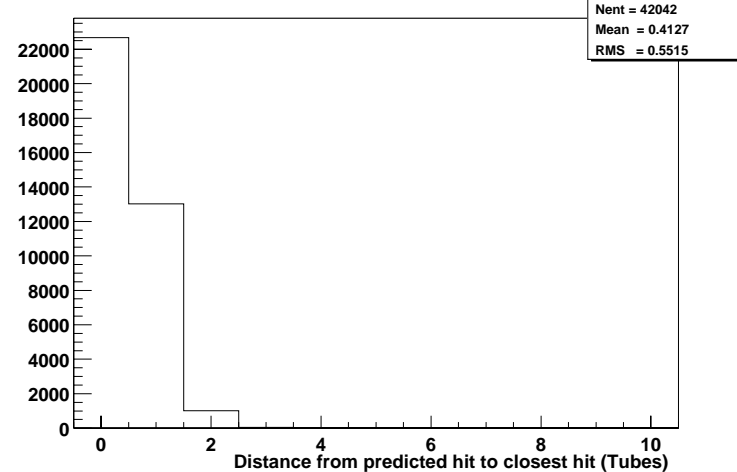
Distance to Match is Gap Dependent

(and orientation dependent)

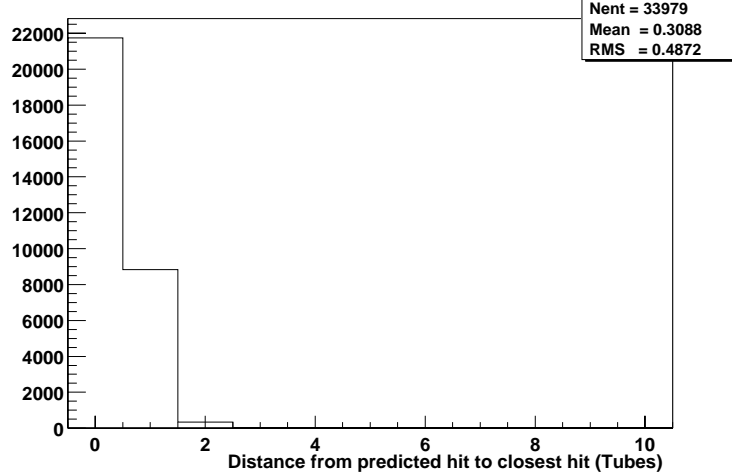
Closest Horizontal Tube: Gap 0



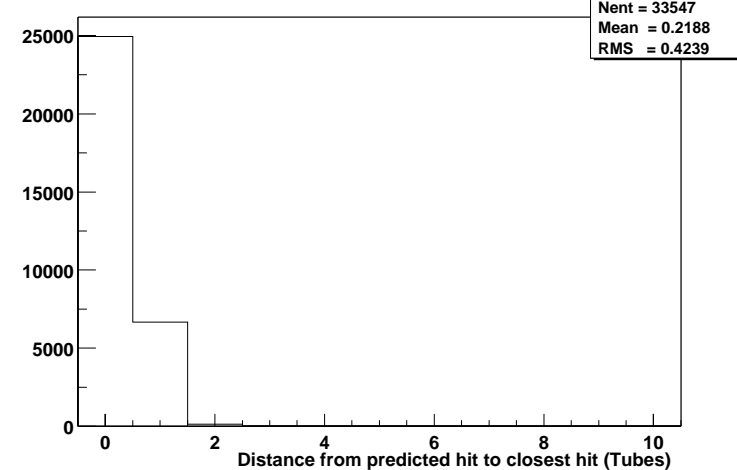
Closest Vertical Tube: Gap 0



Closest Horizontal Tube: Gap 2



Closest Vertical Tube: Gap 2



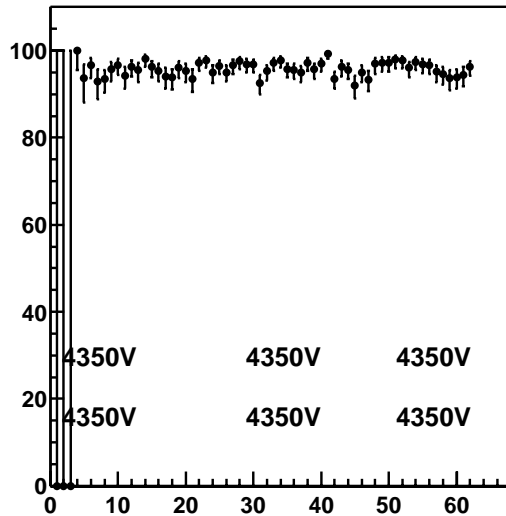
Short Commings

- Some smearing from twopack to twopack.
Can create lower efficiencies at panel edges.
- Does better with inner gaps
(interpolation vs. extrapolation)

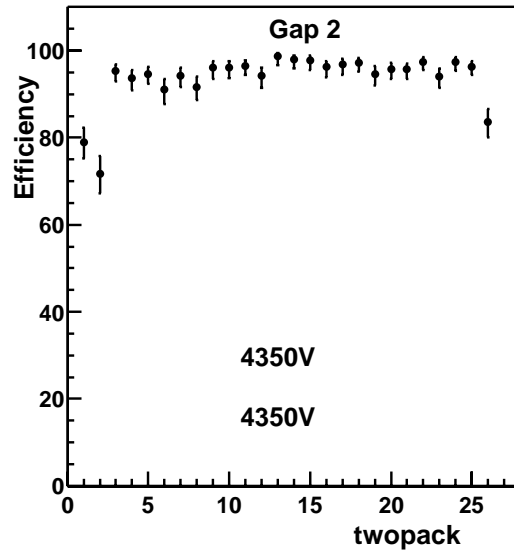
Example: Gap 2 Vertical

Points with error width > 10 not included in panel average.

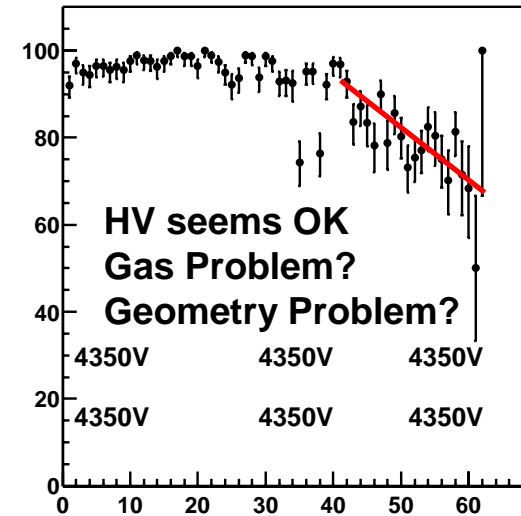
Eff: panel 2, orient 1 Average eff 95.81



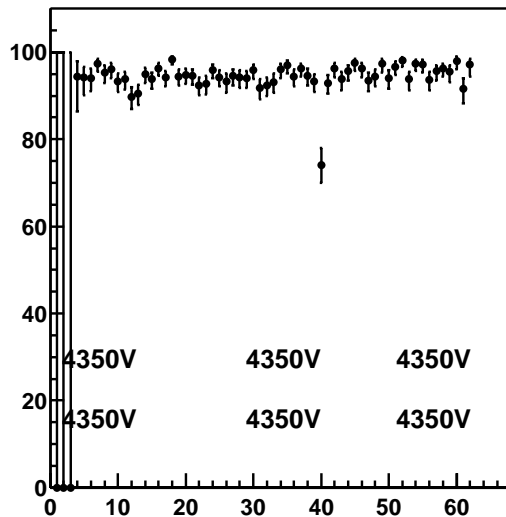
Eff: panel 1, orient 1 Average eff 93.59



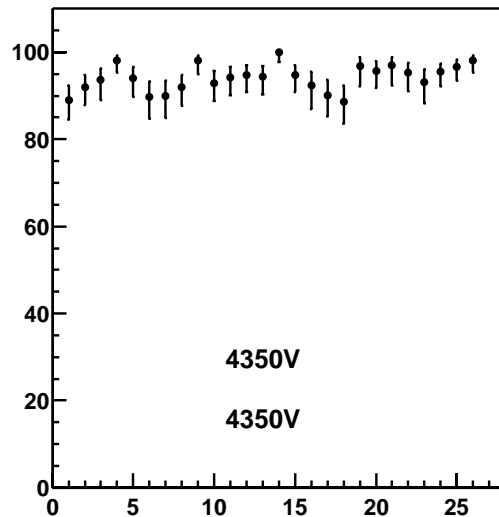
Eff: panel 0, orient 1 Average eff 90.74



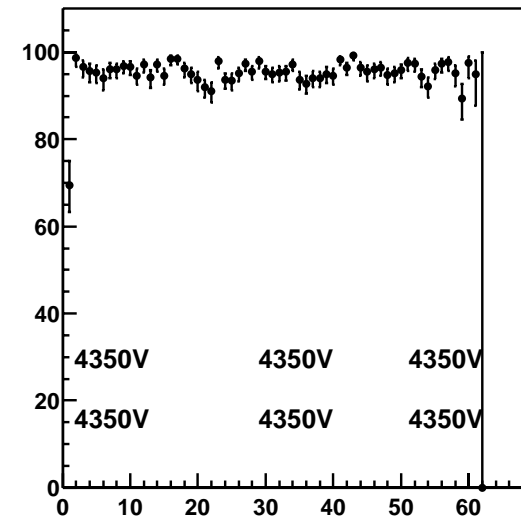
Eff: panel 3, orient 1 Average eff 94.46



Eff: panel 4, orient 1 Average eff 94.13

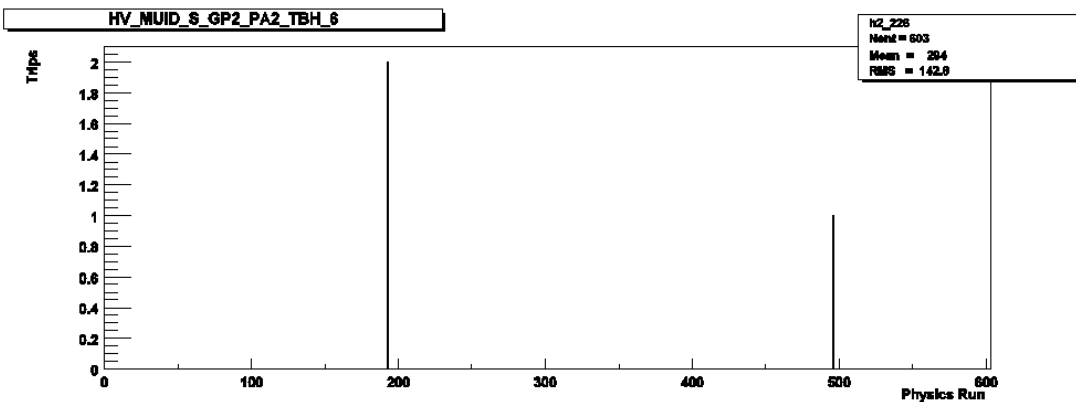
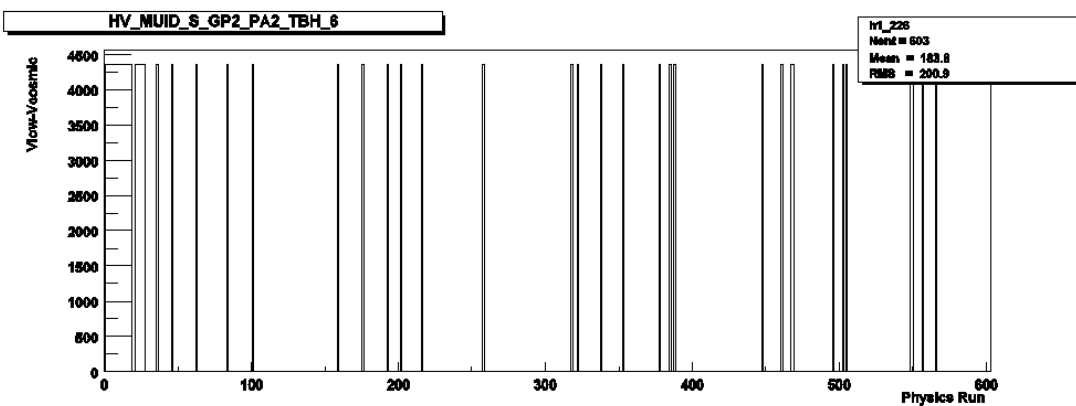
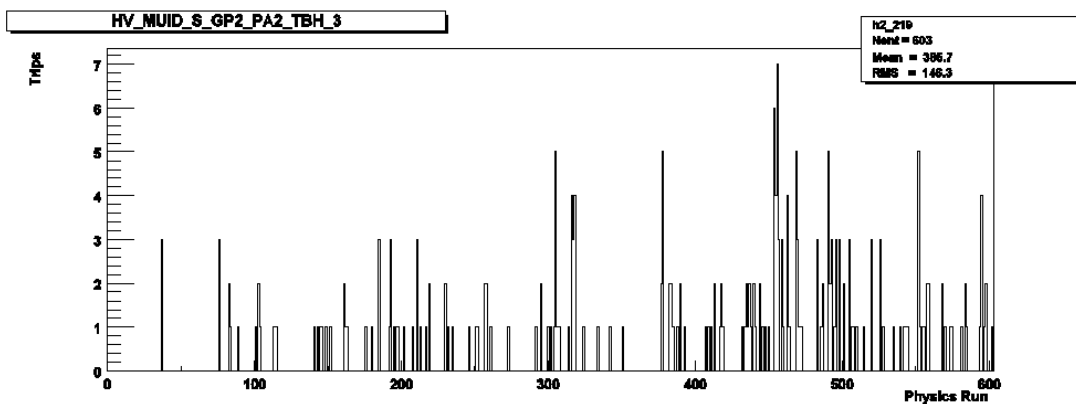
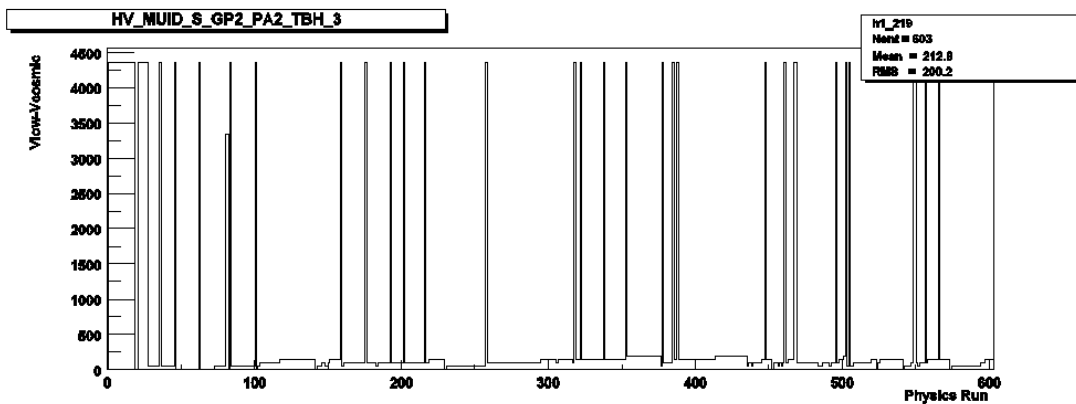


Eff: panel 5, orient 1 Average eff 95.18

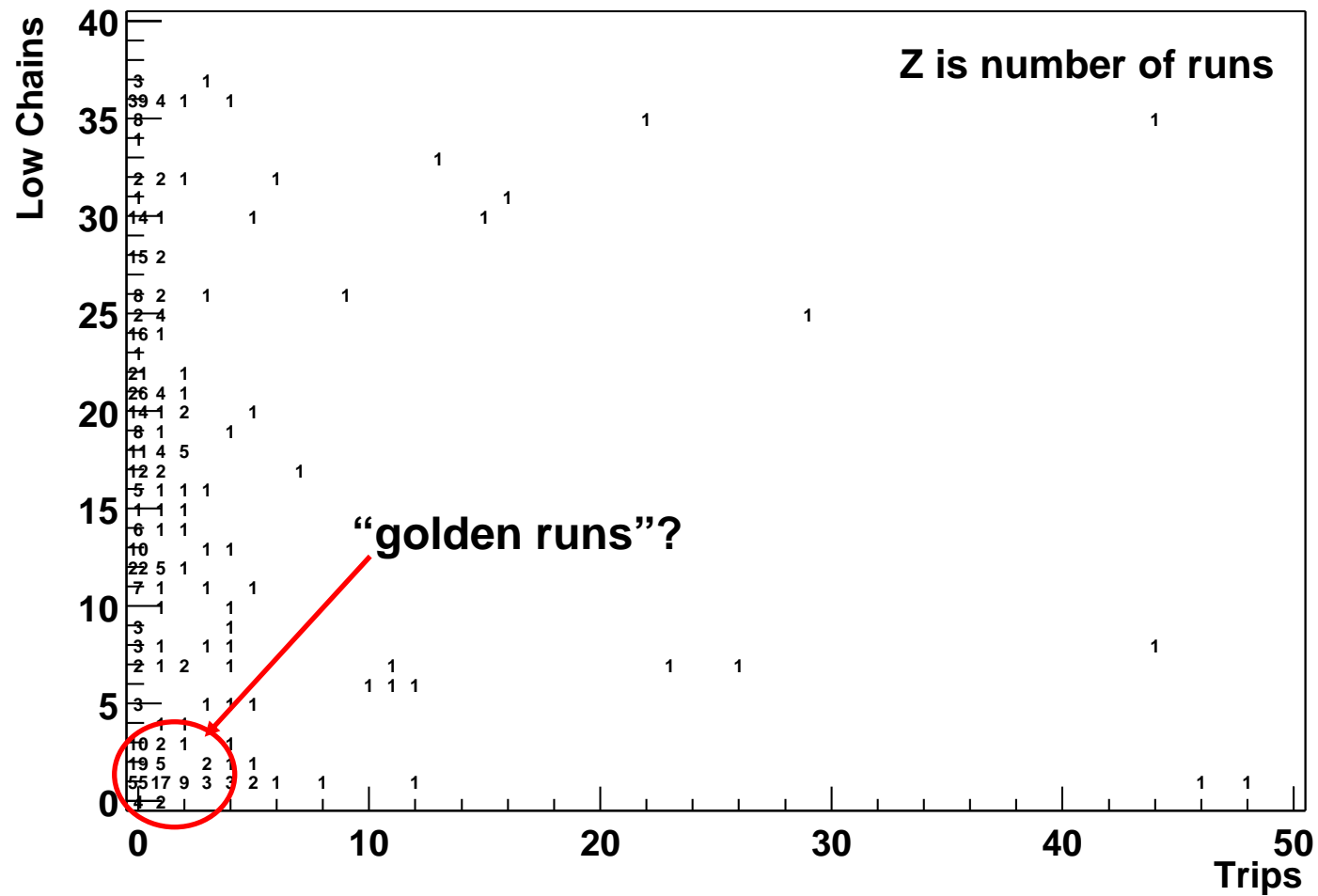


How well does this describe p+p running?

- I have started analyzing the p+p HV logging to see how the status deviates from these cosmic runs.



Trips vs Low



May be slightly misleading due to run control crashes, detector being turned off just before the run ended or on just after run started.

Next Steps

- Continue investigating, characterizing and cleaning up HV logs.
- Implement twopack by twopack efficiencies in response chain.

Hiroki has done a panel by panel study

<https://www.phenix.bnl.gov:8080/phenix/WWW/p/lists/phenix-musoft-l/msg02384.html>

- Decide if some similar run by run... efficiency calculation need to be done on the data.